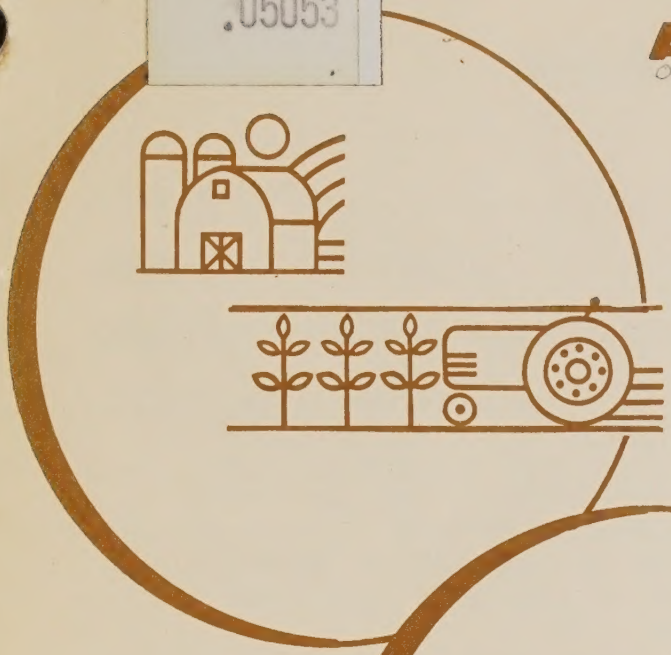
ANALYSIS OF U.S. FOOD INDUSTRY IN A NATIONAL EMERGENCY



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SECTION I - INTRODUCTION

The U.S. Department of Agriculture (USDA) has responsibility for (1) developing standby plans for any needed controls on food processing, storage, and wholesale distribution during a national emergency, and (2) implementing these plans in such an emergency when authorized to do so by the Congress or the President. This responsibility was assigned to the Agricultural Stabilization and Conservation Service (ASCS) November 24, 1974.

The first standby plans were prepared in the early 1960's. Substantial changes were made in these plans in 1967. Additional changes, especially administrative, have now been made. However, before making them, a decision was made to undertake an analysis of the capability of agriculture and the food industry to provide food for the surviving population following a nuclear attack on this country. World nuclear offensive and defensive capabilities have changed, much more information has become available on the effects of a nuclear attack on the food and agricultural industries, and these industries have also changed to some extent.

The results are summarized in this paper, and have been used to revise USDA's standby plans. These plans will be for the early postattack period only -- the first 30 to 60 days after an attack. Those people who survive an attack and are responsible for the food program will have to obtain information about actual conditions. With this information, they should be able to formulate their plans on the best course of action to follow in providing food for the surviving population.

SECTION II - PROBABLE POSTATTACK SITUATION

Our analysis attempted to project the kind of emergency situation for which we are preparing so that standby plans can be as realistic as possible. For the purpose of this analysis, two unclassified attack patterns called "UNCLEX CHARLIE-73" and "UNCLEX MIKE-73" were used. They were developed in 1973 by the Federal Preparedness Agency (FPA), General Services Administration (GSA) as moderately heavy attacks, well within the current offensive capability of countries with nuclear weapons. Date of the attack for the facility and livestock analysis was late March 1973. For crops, FPA ran the attack on two additional dates, June 1 and August 1 so that we could analyze the effects during the major growing seasons. Weapon sizes ranged from 3 to 20 megatons (MT), with 43% being 3 MT and 45% 5 MT. All weapons were ground bursts, except those directed at railroad bridges which were air bursts with 10 PSI peak overpressure.

The two attack patterns included about 1,160 weapons each, assigned to military, civilian and industrial targets. The "CHARLIE" attack concentrates most heavily on civilian and industrial targets, the "MIKE" attack is oriented to military and industrial targets.

Selection of these targets was made on a random basis by the use of a special computer program. Each target was considered to be among those which any potential enemy would reasonably select to accomplish his objective for each attack. Since these attack patterns are unclassified, the targets do not include highly sensitive installations. However, the selected targets are considered fully adequate by FPA for use in developing postattack civilian plans.

TABLE 1

Attack Pattern: Number of Weapons Delivered by State, Region and U.S. Total

REGION	STATE	"CHARLIE"	"MIKE"
1	CT	17	10
	ME	3	None
	MA	25	19
	NH	3	2
	RI	7	5
	VT	None	None
Total Region 1		55	36
2	NJ	44	28
	NY	68	65
Total Region 2		112	93
3	DE	5	3
	DC	9	14
	MD	8	13
	PA	49	30
	VA	25	30
	WV	7	None
Total Region 3		103	90
4	AL	13	5
	FL	44	16
	GA	21	20
	KY	14	6
	MS	5	7
	NC	5	6
	SC	8	4
	TN	12	3
Total Region 4		122	67
5	IL	50	31
	IN	41	19
	MI	60	43
	MN	9	3
	OH	66	36
	WI	16	11
Total Region 5		242	144
6	AR	26	43
	LA	14	5
	NM	8	7
	OK	5	6
	TX	46	36
Total Region 6		99	97
7	IA	13	None
	KS	6	8
	MO	24	25
	NE	25	52
Total Region 7		68	85
8	CO	14	16
	MT	79	160
	ND	61	122
	SD	38	81
	UT	8	None
	WY	9	13
Total Region 8		209	392
9	AZ	20	28
	CA	101	86
	NV	None	None
Total Region 9		121	114
10	ID	6	15
	OR	3	None
	WA	19	20
Total Region 10		28	35
Total U.S.		1,159	1,153

FPA ran both attack patterns against the USDA resources programmed in its computer to provide an analysis of the postattack status of these resources. The resources consist of food processing, storage, and wholesale distribution facilities; grain storage facilities[1/]; livestock and poultry; major crops; and cropland. The extent of coverage for facilities in the computer varies from about 98 percent of the United States total for grain storage and sugar to about 65 percent for a few industries where available data are limited. Data for crops and livestock are from the latest Census of Agriculture and population data was from the 1970 census. The computer analysis prints out the effects of blast, fire, and fallout from UNCLEX attack patterns on these resources. The effect of each attack pattern on USDA resources is shown on separate tables throughout this paper. Location of facility sites in relation to the two attack patterns will create some differences. However, general conclusions common to both attacks can be drawn.

We began with surviving population because it established the potential demand for food. We then considered remaining local supplies of consumable food because these supplies must sustain local population until additional food becomes available. Probable availability of transportation to move food to locations where needed for consumption was also considered.

Following this, we looked at the capability of the food processing industry to continue functioning, and the availability of major inputs needed to maintain this industry. Consideration was given to such potential constraints as the availability of raw material, manpower, electric power, and food containers.

1/ USDA/ASCS Food and Feed Facility Listings, dated 9-30-74. SIC Codes and category codes from the listings are used to identify each class of facility analyzed in Tables 4 through 25.

SECTION III - POPULATION AND FOOD INDUSTRY SUMMARIES

1. Population Surviving Attack. Surviving population is shown in Tables 2 and 3, for the U.S.,1/ for the combined 275 Standard Metropolitan Statistical Areas (SMSA's), and for the combined non-SMSA's.2/

In addition, the SMSA's having the least survival and the rural areas having the highest survival are shown to indicate survival extremes. The percent of population needing food following a nuclear attack is shown by selected time periods. Population survival in the "MIKE" attack, except for the rural areas, is slightly higher than in the "CHARLIE".

1/ U.S. means the 48 mainland States throughout this paper.

2/ SMSA is usually a city that contains 50,000 or more population, and may or may not include all of the county in which it is located and/or parts of contiguous counties.

TABLE 2

Surviving Population for Selected Areas by Time Periods -- "CHARLIE ATTACK"

AREA	PERCENT OF SURVIVING POPULATION BY POSTATTACK TIME PERIODS1/				
	D+1	D+15	D+30	D+60	D+90
U.S.	62	51	49	46	45
SMSA's Combined	44	34	32	30	29
Non-SMSA's	94	83	79	76	74
Worst SMSA of Over 1 Million Preattack Population(New York City)	21	11	9	8	7
Best Rural (South Dakota)	98	94	93	91	90

TABLE 3

Surviving Population for Selected Areas by Time Periods -- "MIKE ATTACK"

AREA	PERCENT OF SURVIVING POPULATION BY POSTATTACK TIME PERIODS1/				
	D+1	D+15	D+30	D+60	D+90
U.S.	73	62	60	57	56
SMSA's Combined	60	49	46	43	42
Non-SMSA's	97	87	84	81	79
Worst SMSA of Over 1 Million Preattack Population (New York City)	29	18	16	14	13
Best Rural (South Dakota)	96	88	86	83	81

1/ D+1 is one day following attack; D+15, 15 days, etc. Preattack population was 210 million. Estimates of surviving population take into account some evacuation from populated areas. There is no major evacuation plan. However, the Defense Civil Preparedness Agency (DCPA) is studying Crisis Relocation Planning (CRP) to determine the feasibility of local evacuation to areas within commuting distance of SMSA's. Introduction of the evacuation factor should result in a higher survival rate. It also presents the problem of providing food for the evacuees.

2. Local Supplies of Consumable Food. The Economic Research Service (ERS) of USDA made a series of studies from 1957 to 1964 on stocks of food in homes, retail stores, establishments that serve food for on-premise consumption, and wholesale warehouses. Findings from these studies represent preattack food stock estimates at the time the studies were conducted. However, we did consult with some leading industry associations and they agreed that for planning purposes, these estimates would be valid. The estimates have not been updated or otherwise adjusted to reflect current or postattack situations. For example, there has been substantial growth in frozen food use in recent years. Frozen foods now account for a larger proportion of total stocks than when the initial studies were made. At the same time, it is recognized that quantities of frozen products and other refrigerated foods may be lost in a postattack environment due to power failure. Information is not sufficient to permit adjustment for changes in these variables or other substantive changes that have occurred throughout food processing and distribution and in shopping practices and eating habits of consumers.

A. Households. The ERS study showed that about a third of the households would run out of home stocked food in a week or less. Some households, such as those in central parts of cities and those with low incomes, would run out in a day or two. About a third of the households could stretch their supplies to last between 1 and 2 weeks. the remaining households could stretch their supplies to last more than 2 weeks, some more than a month. For planning purposes, use 12 days as an average.

B. Retail Stores. On the basis of a normal caloric diet, there was an average of 9 days supply of food in retail stores -- plus or minus a day or two for different areas. About one-fifth of this supply was perishable (fresh or frozen). Food in retail stores is under the emergency jurisdiction of State and local governments. Standby plans provide for retail sales of nonperishable food to be stopped for 5 days after a nuclear attack to allow time for State and local governments to institute a food rationing system. The plan would then permit sales based on a diet of about 2,000 to 2,200 calories of food per day per person. At this level, the 9-day retail food supply might stretch to about 12 days. However, for planning purposes use 9 days.

Retail and household supplies combined could range from 17 to 27 days, with an average of about 21 days. With normal cleaning and preparation, most or all of these supplies located outside of the areas of blast, fire, and heavy fallout should be fairly readily available for household use. Resupply would be necessary well before household-retail supplies are exhausted.

C. Eating Establishments. Currently it is estimated that approximately a third of all meals are eaten on-premises in public eating establishments and institutions such as hospitals, homes for the aged, schools, and colleges. The ERS study of food on hand in these away-from-home

eating establishments showed that there was an average of almost a 2-day supply of food -- with a 1-day variation above and below average in some areas. Delineated information is not available for hospitals and other institutions which must provide on-site food for occupants. It appears that these institutions -- especially hospitals -- would need resupplies almost immediately since a post-attack situation would place a heavy demand on hospital services and a commensurate demand on food service operations.

D. Wholesale Warehouses. The ERS study showed a 10-day supply of food was available in wholesale warehouses -- based on a normal caloric diet -- with a variation of 1 to 5 days by areas of the country. At the 2,000 calorie level, this could stretch to about 16 days. For planning purposes, use 10 days as an average.

Wholesale supplies, plus 21 days of home-retail supply, total about 31 days of preattack food inventory (excluding food in away-from-home eating establishments).

Although we may assume that retail food stocks would be available post-attack somewhat in relation to surviving population, this is not necessarily the case for wholesale stocks -- as will be seen in the following paragraphs.

3. Remaining Food Warehouses. The percentage of accessible wholesale food warehouses remaining postattack are shown in Tables 4 and 5. (Accessible means it is safe for people to work an 8-hour day in the facility.) The percentages are for selected time periods. Surviving population is also shown for comparative purposes.

Since warehouses generally serve trading areas and not only the SMSA's in which they are located, we analyzed surviving population and accessible warehouses by trading areas. The 79 "A. C. Nielsen Trading Areas" as published in the Marketing Guide Book (Progressive Grocer) 1974 were used. Tables 4 and 5 also show warehouse accessibility compared to surviving population for a "typical," "best," and "worst" trading area having a preattack population of over 1 million. (Trading areas having less than 1 million population generally survived better than larger areas.) In addition, the best rural area of the U.S., outside of the 79 trading areas, is shown.

In each table, the "typical" area is one that came closest to the U.S. warehouse/surviving population situation for D+15 through D+60. The "best" area is one that shows the greatest accessibility of warehouses in comparison with surviving population (where warehouses survive considerably better than people). The "worst" area is an area where people survive at a considerably greater rate than warehouse accessibility.

TABLE 4

Remaining Accessible Warehouses (Refrigerated and Nonrefrigerated[1/]) Compared with Suriving Population, by Selected Area and Time Periods "CHARLIE ATTACK"

AREA	WAREHOUSES COMPARED WITH POPULATION, BY TIME PERIODS			
	D+1	D+15	D+30	D+60
	---PERCENT POPULATION SURVIVING OR WAREHOUSES ACCESSIBLE---			
U.S.				
Population	62	51	49	46
Warehouses	20	40	46	56
Typical Trading Area (Indianapolis)				
Population	52	48	47	46
Warehouses	25	55	55	55
Best Large Trading Area (Birmingham)				
Population	54	41	38	34
Warehouses	6	40	51	51
Worst Large Trading Area (Minneapolis--St. Paul)				
Population	56	53	53	52
Warehouses	13	19	19	19
Rural Area (Oklahoma)				
Population	86	83	82	81
Warehouses	90	97	97	97

1/ *Refrigerated is the combination of 9-4222-WAC and 9-4222-WAS. Nonrefrigerated is the combination of 9-5141-FDC, 9-5141-FDW, and 9-5149-FDP.*

TABLE 5

Remaining Accessible Warehouses (Refrigerated and Nonrefrigerated) Compared with Surviving Population, by Selected Area and Time Periods "MIKE ATTACK"

AREA	WAREHOUSES COMPARED WITH POPULATION, BY TIME PERIODS			
	D+1	D+15	D+30	D+60
	----PERCENT POPULATION SURVIVING OR WAREHOUSES ACCESSIBLE----			
U.S.				
Population	73	62	60	57
Warehouses	47	61	65	66
Typical Trading Area (Sacramento)				
Population	73	65	63	61
Warehouses	50	54	54	54
Best Large Trading Area (Milwaukee)				
Population	72	70	69	69
Warehouses	78	78	78	78
Worst Large Trading Area (St. Louis)				
Population	45	36	34	32
Warehouses	4	4	4	4
Rural Area (South Dakota)				
Population	96	88	86	83
Warehouses	39	89	89	89

The "best" and "worst" trading areas indicate the approximate extremes that might be experienced in resupplying food from wholesale to retail (or other outlets in the trading area) for the surviving population. For example, in the "worst" trading areas the percent of the population surviving at D+30 is considerably greater than the percent of warehouses surviving. There are other trading areas with smaller percentages of population surviving, but the ratio of population to warehouses is either more favorable or the area would be so nonviable3/ that civil

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3/ *NONVIABLE means less than 20% of population surviving at D+30.*

defense officials might evacuate surviving population to a more economically viable location.

Food warehouses are classified broadly as refrigerated and nonrefrigerated. Refrigerated warehouses contain such foods as fruits, vegetables, and meats. Because these foods are subject to spoilage, information similar to that in Tables 4 and 5 is provided in Tables 6 and 7 for refrigerated warehouses, and 8 and 9 for nonrefrigerated. The trading areas shown in the first column of these tables are the same as those in Tables 4 and 5.

TABLE 6

Remaining Accessible Refrigerated Warehouses Compared With Population, by Selected Areas and by Time Periods "CHARLIE ATTACK"

AREA	WAREHOUSES COMPARED WITH SURVIVING POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
	---- PERCENT POPULATION SURVIVING OR WAREHOUSES ACCESSIBLE ----			
U.S.				
Population	62	51	49	46
Warehouses	19	43	54	72
Typical Trading Area (Indianapolis)				
Population	52	48	47	46
Warehouses	40	90	90	90
Best Large Trading Area (Birmingham)				
Population	54	41	38	34
Warehouses	10	51	67	67
Worst Large Trading Area (Minneapolis--St. Paul)				
Population	56	53	53	52
Warehouses	53	80	80	80
Rural Area (Oklahoma)				
Population	86	83	82	81
Warehouses	100	100	100	100

TABLE 7

Remaining Accessible Refrigerated Warehouses Compared With Population, by Selected Areas and by Time Periods "MIKE ATTACK"

AREA	WAREHOUSES COMPARED WITH SURVIVING POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT POPULATION SURVIVING OR WAREHOUSES ACCESSIBLE----				
U.S.				
Population	73	62	60	57
Warehouses	53	69	74	76
Typical Trading Area (Sacramento)				
Population	73	65	63	61
Warehouses	72	78	78	78
Best Large Trading Area (Milwaukee)				
Population	72	70	69	69
Warehouses	100	100	100	100
Worst Large Trading Area (St. Louis)				
Population	45	36	34	32
Warehouses	0	0	0	0
Rural Area (South Dakota)				
Population	96	88	86	83
Warehouses	100	100	100	100

Refrigerated warehouses generally are more accessible than the combined totals of both kinds of warehouses (Tables 4 and 5). This is true by time periods (with exception or two) as well as by trading areas and for the U.S. This probably reflects the type of construction and/or location of refrigerated warehouses. It should not be assumed, however, that all refrigerated food can be utilized before spoilage. (See electric power availability later in this paper.)

TABLE 8

Remaining Accessible Nonrefrigerated Warehouses Compared with Population, by Selected Areas and by Time Periods "CHARLIE ATTACK"

AREA	WAREHOUSES COMPARED WITH SURVIVING POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
	----PERCENT SURVIVING POPULATION OR ACCESSIBLE WAREHOUSES----			
U.S.				
Population	62	51	49	46
Warehouses	21	38	40	45
Typical Large Trading Area (Indianapolis)				
Population	52	48	47	46
Warehouses	10	20	20	20
Best Large Trading Area (Birmingham)				
Population	54	41	38	34
Warehouses	0	27	33	33
Worst Large Trading Area (Minneapolis--St. Paul)				
Population	56	53	53	52
Warehouses	3	3	3	3
Rural Area (Oklahoma)				
Population	86	83	82	81
Warehouses	88	96	96	96

TABLE 9

Remaining Accessible Nonrefrigerated Warehouses Compared with Population, by Selected Areas and by Time Periods "MIKE ATTACK"

AREA	WAREHOUSES COMPARED WITH SURVIVING POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
	----PERCENT SURVIVING POPULATION OR ACCESSIBLE WAREHOUSES----			
U.S.				
Population	73	62	60	57
Warehouses	42	55	58	59
Typical Large Trading Area (Sacramento)				
Population	73	65	63	61
Warehouses	6	6	6	6
Best Large Trading Area (Milwaukee)				
Population	72	70	69	69
Warehouses	67	67	67	67
Worst Large Trading Area (St. Louis)				
Population	45	36	34	32
Warehouses	6	6	6	6
Rural Area (South Dakota)				
Population	96	88	86	83
Warehouses	27	91	91	91

Nonrefrigerated warehouses are the principal suppliers of retail stores and are generally less accessible than refrigerated. At D+30, the U.S. has a population/warehouse ratio of about 1 to 1; the best trading areas have a similar ratio. In Minneapolis--St. Paul, the ratio of population to warehouses is almost 18 to 1. This area and others like it will pose an additional problem of obtaining food from outside suppliers.

The analysis shows that insufficient food warehouses in relation to surviving population would pose a problem in about 25-30 percent of the trading areas (19 areas in the "CHARLIE" attack, 22 areas in the "MIKE").

TABLE 10

PROBLEM TRADING AREAS

"CHARLIE ATTACK"	REGION	"MIKE ATTACK"
Boston, MA	1	Manchester, NH
Albany, NY New York, NY* Syracuse, NY*	2	New York, NY*
Baltimore, MD-Wash, DC Erie, PA Johnstown-Altoona, PA Philadelphia, PA Pittsburgh, PA Norfolk, VA* Scranton - Wilkes-Barre, PA	3	Scranton, PA Norfolk, VA Richmond, VA
Savannah, GA Jackson, MS*	4	Tallahassee, FL* Albany, GA Savannah, GA Charleston, SC Memphis, TN
Chicago, IL Cleveland, OH*	5	Cincinnatti, OH* Columbus, OH
El Paso, TX	6	Baton Rouge, LA* New Orleans, LA Shreveport, LA Houston, TX
Des Moines, IA Wichita, KS	7	St. Louis, MO Omaha, NE
None	8	Great Falls, MT*
San Francisco, CA	9	Tucson, AZ
None	10	Seattle, WA Spokane, WA

* Nonviable

A few of these problem areas might be so nonviable that the population would require evacuation. The remaining problem areas, however, could not depend upon significant food stocks being available from wholesalers during the critical 30-day postattack period.

4. Accessibility of Food Processing Industry. Six food processing categories were selected to be analyzed. They are: meat and meat alternates (including eggs), milk and dairy products, cereals and cereal products, fruits and vegetables, food fats and oils, and sugar. From within these six, we selected out specific industries. For comparative purposes, Tables 11 through 13 "All Processing Facilities" means the total capability of the U.S. against the six.

Accessibility of a processing facility does not automatically ensure production capability, since necessary inputs must be available. Most food processing facilities do not carry large inventories, and in some cases, the inventories on hand may not be useable because of the elapsed time before accessibility. Some of the major constraints on output will be discussed later.

A. Total Facilities for the U.S. and by Trading Areas. Unlike most warehouses, many processing facilities serve a larger area than just the trading area in which they are located. However, in view of probable intercity transportation problems in the early postattack period, the principal amount of early processing output would likely be consumed locally. For this reason, we considered the accessibility of the food processing industry only by trading areas, with emphasis on the areas where warehouse availability would pose a major problem.

Table 11 shows the accessibility of food processing facilities compared with surviving population by time periods for the "CHARLIE" attack. Similar data for the "MIKE" attack was not available. Information shown is for the U.S. and for the same trading areas as used for warehouses in Tables 4, 6, and 8. These same areas were used primarily to indicate the local processing facility backup for warehouses in the "worst" trading area (Minneapolis--St. Paul).

TABLE 11

Accessible Food Processing Facilities Compared With Surviving Population, by Selected Areas and Time Periods "CHARLIE ATTACK"

AREA	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
	----PERCENT POPULATION SURVIVING OR FACILITIES ACCESSIBLE----			
U.S.				
Population	62	51	49	46
Facilities	36	61	68	76
Typical Trading Area (Indianapolis)				
Population	52	48	47	46
Facilities	21	40	40	41
Best Large Trading Area (Birmingham)				
Population	54	41	38	34
Facilities	1	38	45	45
Worst Large Trading Area (Minneapolis--St. Paul)				
Population	56	53	53	52
Facilities	19	26	26	26
Rural Area (South Dakota)				
Population	86	83	82	81
Facilities	71	89	90	90

Availability of processing facilities for the U.S. is quite favorable in relation to population. An exception was the "worst" trading area, where the population/processing facility ratio is 2 to 1 compared with a 3 to 1 ratio for population/warehouses (Table 4). This 2 to 1 population/processing facility comparison would be misleading unless we keep in mind that most large trading areas (over 1 million population) are normally deficient in food processing facilities. Most of the U.S. food processing capability is located in and around areas with less than 1 million population.

B. Facility Accessibility by Food Categories. Tables 12 and 13 show accessibility of food processing facilities by time periods for each of the six food categories identified earlier. Information is shown for the U.S. and not for smaller areas such as trading areas or States. (Information for population and all processing facilities is also shown for comparison.) Based on sheer accessibility, each food category compares very favorably with surviving population beginning with D+15. As indicated by this and following tables, an increasing number of facilities become accessible as radioactive fallout decays to safe levels.

TABLE 12

Accessible Food Processing Facilities Compared With Surviving Population, by Food Categories and Time Periods "CHARLIE ATTACK"

FOOD CATEGORY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	62	51	49	46
All Processing Facilities	36	61	68	76
Meat and Meat Alternates	28	52	59	70
Milk and Dairy Products	33	60	67	75
Cereal and Cereal Products	21	47	52	64
Fruits and Vegetables	24	46	57	69
Food Fats and Oils	25	53	62	69
Sugar	28	57	64	73

TABLE 13

Accessible Food Processing Facilities Compared With Surviving Population, by Food Categories and Time Periods "MIKE ATTACK"

FOOD CATEGORY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
--PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES--				
Population	73	62	60	57
All Processing Facilities	52	70	74	77
Meat and Meat Alternates	44	58	61	63
Milk and Dairy Products	56	71	74	75
Cereal and Cereal Products	27	46	52	60
Fruits and Vegetables	46	58	61	64
Food Fats and Oils	39	51	55	56
Sugar	51	65	69	71

Each of the six food categories analyzed contained two or more kinds of facilities (4-digit SIC code groups), such as meat packing plants and poultry dressing plants for the meat and meat alternates category. Tables 14 and 15 show accessibility of these major kinds of facilities for meat and meat alternates. Tables 16 through 23 show similar information for the other food categories.

Milk and dairy products were not analyzed separately since, in most instances, these facilities produce a combination of dairy products (i.e., fluid milk, butter, dry milk). Because of this, there was very little variance between the categories within this food group.

TABLE 14

MEAT AND MEAT ALTERNATES
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"CHARLIE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	62	51	49	46
Total Meat and Meat Alternates	28	52	59	70
Meat Packing (1-2011-LSS)	31	56	63	74
Prepared Meats (1-2013-LSP)	14	30	37	51
Poultry Dressing (1-2016-POP)	39	73	80	85
Poultry Processing (1-2017-POC)	23	40	40	64
Egg Handlers and Processors (2-5144-POH) (2-2017-POD)	34	58	65	70

TABLE 15

MEAT AND MEAT ALTERNATES
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"MIKE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT OF SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	73	62	60	57
Total Meat and Meat Alternates	44	58	61	63
Meat Packing (1-2011-LSS)	49	64	68	69
Prepared Meats (1-2013-LSP)	26	34	35	37
Poultry Dressing (1-2016-POP)	61	80	84	85
Poultry Processing (1-2017-POC)	32	43	47	47
Egg Handlers and Processors (2-5144-POH) (2-2017-POD)	56	73	77	79

The only accessibility problem might be with prepared meat and poultry processing facilities during the first 60 days. However, this is not critical since meat packing and poultry dressing, which is the primary slaughter, are readily accessible by D+15.

TABLE 16

CEREAL AND CEREAL PRODUCTS
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"CHARLIE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	62	51	49	46
Total Cereal and Cereal Products	21	47	52	64
Flour Milling (4-2041-GPF)	30	64	72	79
Corn Products (4-2041-GPP)	35	82	86	89
Blended and Prepared Flour (4-2045-GPN)	11	31	37	45
Bakeries (4-2051-GPB)	19	40	48	60

TABLE 17

CEREAL AND CEREAL PRODUCTS
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"MIKE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	73	62	60	57
Total Cereal and Cereal Products	40	53	56	57
Flour Milling (4-2041-GPF)	54	74	79	79
Corn Products (4-2041-GPP)	49	72	80	80
Blended and Prepared Flour (4-2045-GPN)	29	31	31	31
Bakeries (4-2051-GPB)	39	52	54	56

There is no accessibility problem for milling facilities. There could be a problem with blended and prepared flour facilities during the first 60 days. Although bakeries appear adequate for the U.S., availability of yeast could be a problem. Because of its high perishability, most bakeries receive supplies on a semiweekly basis. Any disruptions in production, refrigeration, or delays in distribution to the bakeries, might necessitate that bakeries shift their production to non-yeast products.

TABLE 18

CANNED AND PRESERVED FRUITS AND VEGETABLES
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"CHARLIE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	62	51	49	46
Total Fruits & Vegetables	24	46	57	69
Canned Fruits & Vegetables (5-2033-FVA)	29	50	61	74
Soups and Specialties (5-2032-FVC)	9	31	44	57

TABLE 19

CANNED AND PRESERVED FRUITS AND VEGETABLES
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"MIKE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	73	62	60	57
Total Fruits & Vegetables	46	58	61	64
Canned Fruits & Vegetables (5-2033-FVA)	54	67	70	73
Soups and Specialties (5-2032-FVC)	24	37	41	41

There is no long term accessibility problem with canned fruits and vegetables. Soups and specialties may present some problem during the first 60 days following a "MIKE" attack.

TABLE 20

FOOD FATS AND OILS
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"CHARLIE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
---- PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES ----				
Population	62	51	49	46
Total Food Fats & Oils	25	53	62	69
Soybean Crushers (6-2075-FOS)	37	79	86	89
Cottonseed Crushers (6-2074-FOC)	39	89	96	96
Edible Fats & Oils Refiners(6-2079-FOM)	20	42	50	61
Corn Oil Facilities (6-2046-GPQ)	7	43	43	57

TABLE 21

FOOD FATS AND OILS
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"MIKE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
---- PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES ----				
Population	73	62	60	57
Total Food Fats & Oils	39	51	55	56
Soybean Crushers (6-2075-FOS)	61	83	87	87
Cottonseed Crushers (6-2074-FOC)	60	77	88	88
Edible Fats & Oils Refiners(6-2079-FOM)	26	33	34	34
Corn Oil Facilities (6-2046-GPQ)	43	43	43	43

There is no long term accessibility problem with total facilities in this category. Edible fats and oil refiners and corn oil facilities may present some problems during the first 60 days following a "MIKE" attack.

TABLE 22

SUGAR
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"CHARLIE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	62	51	49	46
Total Sugar	28	57	64	73
Beet Sugar Mills (8-2063-SUB)	48	88	93	95
Cane Sugar Raw Mills (8-2061-SUC)	88	96	96	96
Cane Sugar Refineries (8-2061-SUR)	29	43	52	52

TABLE 23

SUGAR
Accessibility of Major Kinds of Facilities Compared
With Surviving Population by Time Periods
"MIKE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	73	62	60	57
Total Sugar	51	65	69	71
Beet Sugar Mills (8-2063-SUB)	74	84	95	97
Cane Sugar Raw Mills (8-2061-SUC)	56	90	90	90
Cane Sugar Refineries (8-2061-SUR)	24	48	48	48

Beet mills and raw cane mills are very accessible because they are located primarily in rural areas. Cane sugar refineries are the hardest hit because they are located primarily in port cities, for refining imported sugar. In 1973, the U.S. imported approximately 60 percent of its sugar consumption (including shipments from Hawaii and Puerto Rico). Since we cannot depend upon imports during the early postattack period, only the probable availability of stocks and domestic sugar production should be considered postattack. Current estimate of sugar stocks, shows that the U.S. has approximately an 80-day supply for normal consumption.

5. Accessibility of other food and grain storage and feed preparation facilities. We examined commercial storage of peanuts, edible beans, wheat and rough rice and the facilities that prepare feed for animals and fowl. The percentage of these facilities accessible by time periods is shown in the following tables.

TABLE 24

Food and Feed Grains
Accessibility of Major Kinds of Facilities
Compared with Surviving Population by Time Periods
"CHARLIE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	62	51	49	46
Total Feed Mills (10-2048-GRF)	46	77	84	89
Total Other Food and Grain Storage	54	83	90	94
Peanut Storage (1-4221-FPW)	22	63	73	79
Bean Storage (1-4221-GRB)	30	74	86	95
Rough Rice Storage (10-4221-GRR)	52	83	87	91
Grain Storage (10-4221-GRE)	55	83	90	94

TABLE 25

Food and Feed Grains
Accessibility of Major Kinds of Facilities
Compared with Surviving Population by Time Periods
"MIKE ATTACK"

KIND OF FACILITY	FACILITIES COMPARED WITH POPULATION BY TIME PERIODS			
	D+1	D+15	D+30	D+60
----PERCENT SURVIVING POPULATION OR ACCESSIBLE FACILITIES----				
Population	73	62	60	57
Total Feed Mills (10-2048-GRF)	61	84	90	93
Total Other Food and Grain Storage	57	83	89	93
Peanut Storage (1-4221-FPW)	44	63	68	68
Bean Storage (1-4221-GRB)	69	82	86	92
Rough Rice Storage (10-4221-GRR)	49	83	86	89
Grain Storage (10-4221-GRB)	57	84	89	93

Because these other food and grain storage facilities are in predominately rural areas, accessibility was greater than that of other warehouse or food processing facilities. Also, very little difference was noted in the percent of accessible storage facilities following either attack and total stocks would be sufficient for the surviving population.

A greater percentage of feed grain processors survived the "MIKE" attack than survived the "CHARLIE" attack. However, in either case, survival of facilities was sufficient to provide feed for animals and fowl. Umprocessed grain stocks on hand at these facilities could also be made available to provide additional food for the surviving population if necessary and adviseable.

SECTION IV - NONFOOD REQUISITES

1. Transportation. The foregoing summaries indicate the need for local food transportation within a few days postattack, and for intercity transportation by about D+15. There could be a need for intercity transportation before D+15 in those trading areas where remaining food warehouses and local processing facilities are insufficient.

The Interstate Commerce Commission (ICC) has responsibility for any controls on the use of interstate surface civil transportation in an emergency. ICC standby plans provide for priority movement of food for domestic needs. State and local governments have responsibility for the use of intrastate transportation, subject to Federal policies such as priority movement of food.

The Department of Transportation (DOT) has responsibility for determining the availability of civilian transportation resources in an emergency. ASCS representatives have discussed with DOT and FPA representatives the probable availability of transportation to move food (and feed) from where it is stored to where it is needed in an emergency.

According to DOT, food transportation normally requires only about five percent of total commercial tonnage. In an early postattack situation, much of the remaining 95 percent of this total tonnage would not be needed for its normal use. Considering this and the ICC priority assigned to emergency transportation of food, DOT representatives are reasonably sure that transportation would be available to move food supplies providing the radiation is at a level where transportation personnel could safely operate the equipment, and the fuel was available.

A. Local Transportation. In viable trading areas, truck transportation for moving food from wholesale warehouses to where needed within the trading area probably would be available by D+15 or soon thereafter. If food warehouses are accessible, the related motor equipment would likely be available in most cases. Availability of able-to-work truck drivers and of fuel might constrain movements to some extent. Nevertheless, since local (intrastate) transportation is under jurisdiction of State and local governments, it is believed they would see that movement of essential food is accomplished if possible.

B. Interstate Transportation. Food transported interstate normally moves from processing plants located in or near the area of production to warehouses in the area of consumption. Feed transported interstate usually involves movement of ingredients from the area of production to a local processor in the area of consumption. Both truck and rail transportation are involved, plus some barge transportation in the case of feed grains.

Long distance transportation probably would not be available for the first 15 days postattack, but would become slowly available beginning about D+15, with availability increasing during the 30-day period, D+15 to D+45. In addition to able-to-work operators and fuel constraints already mentioned, some roundabout routing might be necessary because of radioactive fallout and damage to bridges, rail switching yards, etc.

Tables 26, 27, and 28 point out the U.S. averages on the mode of transportation and distances involved for selected foods.

TABLE 26

PERCENT OF FOOD BY CARRIER

Rail	37%
Truck	59%
Water	3.5%
Air	.5%

TABLE 27

PERCENT OF FOOD SHIPPED LESS THAN 300 MILES

Prepared Meats	65%
Fresh Poultry	56%
Eggs	52%
Dairy Products	59%

TABLE 28

PERCENT OF FOOD SHIPPED MORE THAN 500 MILES

Fresh Meat	38%
Frozen Meat	52%
Canned Meat	61%
Frozen Poultry	39%
Canned Fruits and Vegetables	70%
Flour	50%

2. Energy.

A. Electric Power. The Defense Electric Power Administration (DEPA) in the Department of the Interior has emergency responsibility for generation, transmission, distribution, and utilization of electric power. ASCS representatives have discussed with DEPA the probable availability of electric power for the food industry following a nuclear attack. This matter has also been discussed with the Rural Electrification Administration and electrical engineers in the Defense Civil Preparedness Agency.

In addition to destruction or damage to some generating facilities by an attack, there would be a further reduction in the availability of electric power by a phenomenon called electromagnetic pulse (EMP). EMP is caused by a high altitude nuclear detonation. It is a concentration of electricity similar to lightning with a radius of 15 to 2,000 miles. The broadest area of damage would result from a detonation above 100 miles.

Protection from lightning, however, is not adequate for protection against EMP. Only about a fourth of the commercial electric power stations have any built-in protection against EMP damage, and DEPA does not expect this number to increase appreciably.

Nevertheless, DEPA believes that nationally there will be sufficient electric power postattack to meet the reduced demand for essential uses, including food. Some areas would have outages, however, due primarily to damage to high voltage transmission lines. Approximately half of the refrigerated food warehouses in the U.S. have some alternate sources of power, generate their own power, or have some standby generating capability; while food processing facilities have virtually none.

B. Petroleum Fuels. Over a third of the petroleum fuel consumed in the U.S. in 1974 was imported. Availability of significant imports for some time postattack is questionable and fuels are expected to be in short supply. An earlier unclassified study indicated that approximately a third of U.S. oil refining capacity would be available fairly early postattack. The Department of Interior, which has resource responsibility for fuel, has indicated clearly that food and agriculture would be given priority for essential production. However, the embargo and fuel shortages of 1973-74 demonstrated the kinds of problems that can arise even under peacetime circumstances.

C. Natural Gas. The dairy and egg products industries are almost totally dependent upon natural gas for processing. Any disruption in the gas flow could prevent fluid milk from being pastuerized, dried or condensed and egg products from being pastuerized or dried.

This could result in a total loss of these food products. Some segments of the food canning industry could also be affected, especially those using natural gas for the soldering of cans.

The shortages experienced in the winters of 1975-77 have pointed up the need for conversion to alternate fuels. However, in the case of dried milk and eggs, the fumes emitted by other fuels, i.e., LP gas, fuel oil, etc., tends to affect the palatability of those products. In addition, most of these industries do not have the equipment for converting. Critical decisions would have to be made in a postattack situation in recommending to Department of Interior the allocation of natural gas to reduce to a minimum any loss of food products.

3. Food Containers and Packaging Materials. An earlier unclassified study indicated that:

A. For Food Containers, metal cans would be in short supply during the 60-day postattack period. Use of glass containers would be limited by a shortage of closures for them. Milk cartons probably would be in short supply even for the milk that could go into the fresh fluid market. Information was not available on plastic containers. However, since plastic is a derivitive of oil, we can assume that supplies would be limited to the stocks on hand.

B. For Packaging Materials, paperboard materials and wirebound wooden boxes should be adequate for food that is likely to be processed and shipped during the 30-60 day postattack period.

SECTION V - AGRICULTURAL PRODUCTION

1. Farm Workers. About 80-85 percent of the farm labor force survived at D+60, based on information for non-SMSA's. Farmers cannot accurately determine fallout denial time on their farms or the amount of radiation dosage they receive. Nevertheless, based upon general denial time information it is believed that most able-to-work farmers could perform some farm operations on a part-time basis by D+15. This information is to be provided by local civil defense authorities following a nuclear attack.

2. Surviving Livestock and Poultry. This information is shown in Table 29 for the U.S., by time periods. Population is also shown again for comparative purposes.

TABLE 29

LIVESTOCK AND POULTRY AVAILABLE FOR FOOD AND/OR PRODUCTION

KIND	TIME PERIODS "CHARLIE ATTACK" D+30	D+60	TIME PERIODS "MIKE ATTACK" D+30	D+60
	----PERCENT SURVIVING----			
Population	49	46	60	57
Beef	64	57	66	61
Swine	65	64	68	66
Dairy	57	55	69	67
Broilers	55	54	72	71
Layers	54	53	65	64
Turkeys	64	62	66	64
Sheep and Lambs	70	68	73	72

Both beef animals and swine survive better than population. Salvage of nonsurviving animals probably would be very low because of uncertainties, denial time, and other constraints. Poultry also survive better than population, but inability to care for those in houses during the early postattack period, and shortages of feed in most commercial poultry producing areas, would lower the survival rate considerably.

Dairy cattle also survive relatively well. However, milk production of surviving animals would be reduced considerably due to lack of early postattack care and some illness. In addition, some of the production

during the first month would need to be diverted from fresh fluid markets to dried or condensed milk or other dairy products because of the radio-iodine problem. However, shortage of natural gas could negate this diversion. In most cases, feed mill availability would be adequate for manufacturing feed for surviving livestock and poultry.

3. Surviving Crops. Crops are usually more sensitive to radioactive fallout during the early growth and reproductive stages. Because of this varying sensitivity, the analysis on crops was made for two dates, June 1 and August 1. Table 30 shows the percentage of yield remaining from the attack on these two dates for eight crops. Yield is expressed in bushels and/or hundredweight per acre. For example: On June 1, 1974, there were approximately 656 million acres of corn planted with an expected national average yield of 74 bushels per acre. Therefore, with the "CHARLIE" attack on June 1, the expected yield remaining is 39% or about 29 bushels per acre as a national average. Compare this with an August 1 attack, when corn is nearly matured, we see an 83% yield remaining or about 61 bushels per acre.

TABLE 30

U.S. YIELD REMAINING FOR SPECIFIED CROPS
JUNE 1 and AUGUST 1

CROP	YIELD REMAINING "CHARLIE ATTACK"		YIELD REMAINING "MIKE ATTACK"	
	JUNE 1	AUGUST 1	JUNE 1	AUGUST 1
	----PERCENT----			
Corn	39	83	28	78
Grain Sorghum	93	97	82	92
Barley	39	78	42	71
Soybeans	100	35	100	33
Wheat	48	82	53	83
Rye	24	87	27	84
Irish Potatoes	45	82	42	77
Alfalfa	87	95	75	93

In most areas, these two dates probably represent the period of maximum vulnerability for these crops. Sugar beets are not included, but available research data on the effects of fallout on sugar beets indicates that the remaining yield would be similar to Irish potatoes.

4. Production Interrelationships. Farm productivity is decreased (or lost in some cases) if inputs are not available. Fuel availability has already been indicated. Fuel-using equipment already on farms would be available wherever farmers survive, but inability to obtain parts as needed may hamper operations. Little attention has been given availability of irrigation water, but most irrigation reservoirs would probably be away from direct weapons targets. Fallout on these reservoirs would not present an agricultural problem.

Fertilizer losses would not be a major problem for a short-term period of a few weeks, but could create a decline in farm output over the longer run. The pesticide problem would be somewhat similar. Seed would not be a major problem.

The depressing effect of combined constraints on the whole production system -- purchased input, capital, management, labor, fallout, etc., --on farm output has not been fully evaluated. However, it is fairly certain that postattack farm production would be adequate for the surviving population regardless of when an attack might occur.

SECTION VI - OTHER MAJOR FACTORS

1. Exports. The Department of Commerce has responsibility for export controls during a defense emergency. They have informed us that export activity through the D+60 period would be limited to U.S. military needs and allied nations in dire need of food. Following this period we can assume that exports would not exceed the preattack ratios of exports to total production.

2. Price Freeze. Standby plans provide for a general price freeze to be imposed by the Federal government. The freeze, which would include agricultural commodities and food, would hold prices at late preattack levels during the early postattack period.

3. Rationing. As indicated earlier, retail sales of nonperishable food will be stopped to allow time for State and local governments to institute a temporary food rationing system. Stores will reopen within 5 days or as soon thereafter as conditions permit. Sales would resume at the rate of about 2,000 to 2,200 calories of food per person per day.

State government standby resource management plans specify maximum quantities of specific food allowed per person per week under the rationing system. This quantity is based on the USDA National Emergency Maximum Food Distribution Allowance[1/]. One food may be substituted or partially substituted for another. When necessary because of shortages, all available foods would be rationed whether or not they would contribute to a nutritionally balanced diet. Also, when necessary, quantities rationed would be reduced below the 2,000 to 2,200 caloric level.

4. Special Diets. State government plans provide for special diets such as those for infants and those prescribed by doctors.

5. Probable Postattack Operating Capability of USDA, SEB's, and State Governments. Although USDA and State government employees are not programmed separately in the computer, we attempted to ascertain their probable postattack operating capability, especially in those locations within a problem trading area. To do this we looked at the surviving population from each attack pattern and assumed that USDA and State government employees survived at the same rate as the total population in these locations. The percent of the surviving population in these cities is shown on the following tables. Surviving population varied from region to region. However, in general, the "CHARLIE" attack pattern had greater impact on probable operating capability than did the "MIKE" attack.

The impact of nuclear attack on probable operating capability was most noticeable in Region 2.

1/ Appendix 1, Defense Food Suborder No. 2A of Defense Food Order No. 2.

TABLE 31

REGION 2 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
NJ 1/	20	Somerset 2/	8	W. Trenton 2/	25	Trenton 2/	25
NY 1/	26	Syracuse 2/	58	Albany 2/	38		
"MIKE ATTACK"							
NJ 1/	40	Somerset 2/	52	W. Trenton	31	Trenton	31
NY 1/	38	Syracuse	69	Albany	62		

1/ States which have problem trading areas.
2/ Office located within a problem trading area.

In this region, following the "CHARLIE" attack, surviving populations in the cities where SEB's, ESO's, and State capitals were located, ranged from a low of 8 percent to a maximum of 58 percent. All of these cities were located in problem trading areas where food problems were expected to be most severe. All but one (Albany, NY) were located in trading areas so nonviable that evacuation might be necessary.

Operational problems in this region might be less severe following the "MIKE" attack. Following this attack, one SEB was located in a problem trading area. However, both States had problem trading areas within their boundaries and surviving State populations were among the lowest in the nation.

The region where operating capability appeared to be affected the least was Region 8 following the "CHARLIE" attack pattern.

TABLE 32

REGION 2 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
CO	64	Denver	48	Golden	48		
MT	86	Bozeman	86	Helena	86		
ND	88	Fargo	95	Bismark	88		
SD	93	Huron	93	Pierre	93		
UT	67	Salt Lake City	41				
WY	84	Casper	84	Cheyenne	84		
"MIKE ATTACK"							
CO	90	Denver	99	Golden	99		
MT 1/	83	Bozeman	83	Helena	83		
ND	84	Fargo	94	Bismark	86		
SD	86	Huron	86	Pierre	86		
UT	99	Salt Lake City	99				
WY	84	Casper	84	Cheyenne	84		

1/ States which have problem trading areas.

Except for one city (Salt Lake), surviving State and city populations were near or exceed 1/2 of the preattack population. None of the State offices were located in problem trading areas.

No attempt has been made to measure the relative operating capabilities of each region. However, a review of Tables 33 through 40 will provide some indication of the problem areas within each region as compared with Regions 2 and 8.

TABLE 33

REGION 1 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
CT	36	Hartford	35				
ME	89	Orono	89	Augusta	89		
MA 1/	36	Amherst	39	Framingham 2/	21	Boston 2/	21
NH	66	Concord	66				
RI 1/	25	W. Warwick 2/	29	Providence 2/			
VT	90	Burlington	90			Montpelier	90
"MIKE ATTACK"							
CT	48	Hartford	31				
ME	78	Orono	78	Augusta	78		
MA	45	Amherst	49	Framingham	25	Boston	25
NH 1/	65	Concord 2/	54				
RI	27	W. Warwick	26	Providence	26		
VT	91	Burlington	91			Montpelier	91

1/ States which have problem trading areas.
2/ Office located within a problem trading area.

TABLE 34

REGION 3 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
DE 1/	35	Newark	28	Delaware City	28	Dover 2/	28
DC 1/	23	DC 2/	28				
MD 1/	44	College Park 2/	28	Pikesville 2/	28	Annapolis 2/	28
PA 1/	34	Harrisburg	34				
VA 1/	58	Richmond	96				
WV 1/	60	Morgantown 2/	60	Charleston	54		
"MIKE ATTACK"							
DE	47	Newark	58	Delaware City	58	Dover	58
DC	20	DC	20				
MD	45	College Park	20	Pikesville	39	Annapolis	33
PA 1/	66	Harrisburg	48				
VA 1/	55	Richmond 2/	30				
WV	67	Morgantown	67	Charleston	82		

1/ States which have problem trading areas.
2/ Office located within a problem trading area.

TABLE 35

REGION 4 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
AL	60	Montgomery	45				
FL	55	Gainsville	96			Tallahassee	19
GA[1]	55	Athens	55			Atlanta	27
KY	62	Lexington	14	Frankfort	28		
MS[1]	75	Jackson[2]	17				
NC	78	Raleigh	62				
SC	55	Columbia	50				
TN	65	Nashville	65	Pegram	65		
"MIKE ATTACK"							
AL	71	Montgomery	95				
FL[1]	84	Gainsville	99			Tallahassee[2]	19
GA[1]	69	Athens	52			Atlanta	52
KY	62	Lexington	99	Frankfort	30		
MS	84	Jackson	99				
NC	68	Raleigh	68				
SC[1]	64	Columbia	25				
TN[1]	75	Nashville	65	Pegram	65		

1/ States which have problem trading areas.
2/ Office located within a problem trading area.

TABLE 36

REGION 5 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
IL	48	Springfield	33				
IN	51	Indianapolis	47				
MI	39	E. Lansing	32			Lansing	32
MN	74	St. Paul	49				
OH1/	33	Columbus	29	Worthington	29		
WI	74	Madison	99				
"MIKE ATTACK"							
IL	61	Springfield	43				
IN	61	Indianapolis	41				
MI	59	E. Lansing	38			Lansing	38
MN	82	St. Paul	63				
OH1/	52	Columbus2/	64	Worthington	64		
WI	83	Madison	99				

1/ States which have problem trading areas.
2/ Office located within a problem trading area.

TABLE 37

REGION 6 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
AR	71	Little Rock	51				
LA	54	Alexandria	34	Monroe	96	Baton Rouge	40
NM	68	Alburquerque	26	Santa Fe	26		
OK	82	Stillwater	82	Oklahoma City	50		
TX[1/]	54	College Station	54			Austin	26
"MIKE ATTACK"							
AR	87	Little Rock	87				
LA[1/]	59	Alexandria	99	Monroe	97	Baton Rouge[2/]	14
NM	91	Alburquerque	99	Santa Fe	87		
OK	84	Stillwater	99	Oklahoma City	58		
TX[1/]	61	College Station	99			Austin	19

1/ States which have problem trading areas.
2/ Office located within problem trading area.

TABLE 38

REGION 7 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
IA 1/	74	Des Moines 2/	36				
KS 1/	90	Manhattan	90	Topeka	99		
MO	63	Columbia	99	Jefferson City	99		
NE	74	Lincoln	75				
"MIKE ATTACK"							
IA	95	Des Moines	99				
KS	95	Manhattan	94	Topeka	91		
MO 1/	62	Columbia	99	Jefferson City	99		
NE 1/	69	Lincoln 2/	50				

1/ States which have problem trading areas.
2/ Office located within problem trading area.

TABLE 39

REGION 9 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
AZ	56	Phoenix	53				
CA[1]/	29	Davis	45	Sacramento	45		
NV	99	Reno	99	Carson City	99		
"MIKE ATTACK"							
AZ[1]/	51	Phoenix	46				
CA	36	Davis	44	Sacramento	49		
NV	99	Reno	99	Carson City	99		

1/ States which have problem trading areas.

TABLE 40

REGION 10 as of D+30

STATE	PERCENT STATE POP. SURVIVE	SEB LOCATION	PERCENT POP. SURVIVE	EMERGENCY STATE OFFICE LOCATION (If Different)	PERCENT POP. SURVIVE	CAPITAL CITY (If Different)	PERCENT POP. SURVIVE
"CHARLIE ATTACK"							
ID	90	Boise	99				
OR	79	Portland	54	Salem	99		
WA	55	Spokane	58	Pullman	58	Olympia	27
"MIKE ATTACK"							
ID	90	Boise	99				
OR	99	Portland	99	Salem	99		
WA1/	66	Spokane2/	46	Pullman	66	Olympia2/	30

1/ States which have problem trading areas.
2/ Office located within problem trading area.

6. Probable postattack operating capability of USDA Regional Staffs at FPA and DCPA Regional headquarters locations. As with SEB's and State government locations, we looked at the surviving population in the cities in which Federal Preparedness Agency (FPA) and Defense Civil Preparedness Agency (DCPA) regional offices were located. It is assumed that USDA, FPA, and DCPA regional staffs were in position in these locations preattack and survived at the same rate as the population in those cities. The percent of surviving population is shown in the following tables.

TABLE 41
"CHARLIE ATTACK"

FPA REGION	FPA HEADQUARTERS	% POP. SURVIVAL	DCPA REGION	DCPA HEADQUARTERS	% POP. SURVIVAL
1	Boston, MA	21	1	Maynard, MA	29
2	New York, NY	8			
3	Philadelphia, PA	21	2	Olney, MD	28
4	Atlanta, GA	27	3	Thomasville, GA	55
5	Chicago, IL	31	4	Battle Creek, MI	58
6	Dallas, TX	25	5	Denton, TX	25
7	Kansas City, KS	50			
8	Denver, CO	48	6	Denver, CO	48
9	San Francisco, CA	19	7	Santa Rosa, CA	99
10	Seattle, WA	32	8	Bothell, WA	32

TABLE 42
"MIKE ATTACK"

FPA REGION	FPA HEADQUARTERS	% POP. SURVIVAL	DCPA REGION	DCPA HEADQUARTERS	% POP. SURVIVAL
1	Boston, MA	26	1	Maynard, MA	25
2	New York, NY	10			
3	Philadelphia, PA	35	2	Olney, MD	33
4	Atlanta, GA	52	3	Thomasville, GA	69
5	Chicago, IL	42	4	Battle Creek, MI	97
6	Dallas, TX	41	5	Denton, TX	41
7	Kansas City, KS	60			
8	Denver, CO	99	6	Denver, CO	99
9	San Francisco, CA	30	7	Santa Rosa, CA	99
10	Seattle, WA	48	8	Bothell, WA	48

Population surviving in FPA regional headquarters cities would be considerably less following the "CHARLIE" attack than following the "MIKE" attack. Following the "CHARLIE" attack, population in 6 FPA headquarters cities survival was less than 30%. Severe operational problems could be anticipated in those cities. In the other 4 cities, population ranged between 30 and 50%. As a result, some operating problems could also be anticipated.

Because of their locations, the attack pattern was less critical in DCPA headquarters cities and surviving populations were generally greater than in FPA headquarters locations. Additionally, many of the DCPA locations are "hardened" sites, and therefore, the effect on their operating capabilities would be minimized.

SECTION VII - BRIEF CONCLUSIONS

Combined household and retail food stocks would last on an average of 21 days for most consumers at the 2,000 to 2,200 calorie level. Most retailers would need to be resupplied beginning on D+15. On-premise eating institutions (hospitals, etc.) would need to be resupplied almost immediately.

Wholesale stocks at the 2,000 to 2,200 calorie level would last on an average of 10 days in most areas. However, some trading areas -- which appear to be economically viable or nearly so -- would have only limited wholesale food stocks left postattack with practically no non-refrigerated stocks in a few areas. Available food processing facilities would be even more deficient than warehouses in most of these areas. This situation would cause major problems in obtaining supplies from other areas by the time institutional users and retailers need resupplies. In some cases, alternate wholesale distributors would need to be used temporarily.

Food processing facilities would generally be adequate by D+15 to D+30, although there would be shortages of a few kinds of facilities. However, output would be constrained substantially by a combination of shortages, and may not exceed the 2,000 to 2,200 calorie level per capita during the 30-60-day postattack period.

Food and feed grains and dry edible beans would be accessible in more-than-adequate quantities. Farm production would be adequate, though it would be a problem in areas of heavy fallout damage. Only a minimum of livestock and poultry could be salvaged postattack. Disposal of dead animals would be a problem. The ratio of surviving meat animals to poultry would be different, perhaps substantially different, in a post-attack situation until poultry production could be increased. The mix of crops would also be different during the first year if an attack occurred during the growing season.

Sugar imports could not be counted upon for a while. (Neither could banana, coffee, tea, nor cocoa imports, but they were not included in the analysis.) However, sugar stocks plus domestic production would be sufficient to meet minimum requirements during the short run period.

Normal distribution channels would be substantially disrupted in much of the country except the more rural areas. Transportation for moving food within economically viable trading areas probably would be available by the time movement became essential, with the exception of food for hospitals, etc., and for mass feeding. (We assume surviving people may be evacuated from nonviable areas rather than moving food into such areas.) Transportation for long distance food movement probably would not be generally available by the time distant food supplies are needed, even though food movement is given priority. This would be especially

true for those trading areas with relatively few food warehouses left. Transportation for feed ingredients would present major problems.

SEB capability to manage primary food stocks would often be least in those States with major problem trading areas.